New Species of Uredineae—III.

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The following sixteen species of rusts have been detected among material sent for identification, in large part submitted by Professor F. S. Earle, curator of fungi of the New York Botanical Garden. I am also directly indebted for material to E. W. D. Holway, C. V. Piper, J. M. Bates and E. Bartholomew and indirectly to Messrs. Heller, Baker, Tracy, Goodding, Craig, Underwood and Griggs. Two thirds of the species are trans-Mississippian, and the remainder from Porto Rico. It is worthy of special note that, with the exception possibly of four species at the most, the descriptions here given are incomplete, as they include but one or two out of the possible three, four, or even more spore-forms. It should be the endeavor of those botanists, who are privileged to collect in the regions where these species abound, to secure the remaining spore-forms in order that the descriptions may be completed.

Uromyces Pavoniae sp. nov.

III. Teleutosori hypophyllous, round, crowded in circinating groups, 1–3 mm. across, compact, early naked, pulvinate, chestnut-brown; teleutospores obovate-globose, 18–20 by 23–28 μ, rounded at both ends; wall medium thick, 2–3 μ, thicker above, 4–7 μ, smooth, chestnut-brown; pedicel slender, colorless, once to twice length of spore.

On *Pavonia racemosa* L., between Mayaguez and Joyua, Porto Rico, June 14 to July 22, 1901, *L. M. Underwood, no. 193*. The species belongs to the section *Lepto-Uromyces*, as the spores germinate in the sorus.

Uromyces Hellerianus sp. nov.

O, I. Spermogonia and aecidia unknown.

II. Uredosori hypophyllous, round, early naked, pulverulent, light chestnut-brown, encircling epidermis inconspicuous; uredospores globose, sometimes triangular-globose, 20–26 μ in diameter; wall thin, 1.5–2 μ, cinnamon-brown, pores 2 or 3, scattered.

III. Teleutosori hypophyllous, round, early naked, pulverulent, dark chestnut-brown, encircling epidermis inconspicuous; teleutospores globoid to ovoid, 21–24 by 27–36 μ, rounded at both ends; wall smooth, chestnut-brown, thick, 3 μ, apex with a prominent, hyaline umbo, 7–11 μ; pedicel less than half length of spore, delicate, colorless.

On *Cayaponia racemosa* (Sw.) Cogn., Adjuntas road five miles from Ponce, Porto Rico, December 4, 1902, *A. A. Heller, no. 6206*. Differs from *Uromyces Cayaponiae* P. Henn. especially in having smooth teleutospores with a large umbo.

Puccinia Canadensis sp. nov.

III. Teleutosori amphigenous, somewhat gregarious, pustular, coalescing, soon naked, pulverulent, chestnut-brown, remains of the membranous epidermis conspicuous; teleutospores narrowly elliptical or linear-oblong, 10–15 by 37–58 μ, obtuse at both ends; wall thin, 1–2 μ, cinnamon-brown, minutely rugose, hyaline and thicker at apex, 3–5 μ; pedicel delicate, very short, colorless, partially deciduous.

On *Viola orbiculata* Geyer (type), Laggan, Alberta, August 23, 1902, and Glacier, British Columbia, September 3, 1902; both collections by *E. W. D. Holway*. Hosts determined by Edward L. Greene. This species is the American representative of the European *P. alpina*, and like it belongs to the section *Micropuccinia*. It differs in having paler and more slender spores, with more irregular sculpturing, which is so minute that it can scarcely be detected except when dry.

In July, 1901, the writer with Mr. Holway published a paper in the *Minnesota Botanical Studies* on the violet rusts of North America, in which *Aecidium pedatum* (Schw.) Arth., *Puccinia Violae* (Schum.) DC. and *P. effusa* D. & H., the then known species, were fully described. Since that time Mr. Holway has not only collected the above additional species, but has also found *P. Fergussoni* B. & Br. on *Viola Langsdorfii* Fisch., at Glacier, B. C., August 10, 1901.

Puccinia Parnassiae sp. nov.

III. Teleutosori amphigenous, somewhat gregarious, pustular, coalescing, soon naked, pulverulent, chocolate-brown, membranous epidermis conspicuous; teleutospores elliptical, 16–20 by 30–37 μ, rounded or obtuse at both ends; wall uniformly thin, 1–2 μ, chestnut-brown, smooth or obscurely punctate above, sometimes with slight hyaline umbo at apex; pedicel colorless, half the length of spore or less, appearing shorter by being partially deciduous.

On *Parnassia fimbriata* Banks, Banff, Alberta, August 16, 1902 (type), *E. W. D. Holway*. Also on same host at Silver Lake, Utah, 9,000 ft. alt., August 15, 1903, *A. O. Garrett, no. 288*. The species apparently possesses no uredo, as no trace of uredospores could be found even in the teleutosori. It may belong to the section *Micropuccinia*. A species of *Uromyces* occurs on *Parnassia* in Europe and a heteroecismal *Aecidium*, but no *Puccinia*. The *Uredo Parnassiae* West. of Belgium, said to be on *Parnassia palustris*, is shown by Lagerheim to be an error for *Uromyces Valerianae*.

Puccinia Sieversiae sp. nov.

III. Teleutosori amphigenous, but more beneath, scattered, round or oval, at first bullate and covered by the thin epidermis, soon naked, pulverulent, chestnut-brown; teleutospores elliptical or obovate-oblong, 20–26 by 32–40 μ, rounded at both ends or somewhat narrowed below, slightly or not constricted at the septum; wall obscurely rugose, appearing smooth, cinnamon-brown, medium thick, 1.5–2.5 μ, thicker above, 4–6 μ, sometimes with semi-hyaline umbo; pedicel short, half length of spore or less, delicate, nearly colorless.

On *Sieversia turbinata* (Rydb.) Greene, Fish Lake, Uintah Mts., Utah, July 17, 1902, *Leslie N. Goodding, no. 1377*. The species is one of the very few belonging to this genus occurring upon the *Rosaceae*.

Puccinia Bakeriana sp. nov.

II. Uredosori hypophyllous, round, early naked, pulverulent, cinnamon-brown; uredospores large, globose, or obovoid, 34–42 by 39–45 μ; wall light honey-yellow, thick, 4–6 μ at sides, 12 μ at apex, closely and coarsely tuberculate, pores large, three, approximately equatorial; contents orange when fresh, segregated.

III. Teleutosori hypophyllous, scattered, round, early naked, pulverulent, chocolate-brown; teleutospores ellipsoid, sometimes

obovate-oblong, irregular, 24–32 by 40–55 μ, rounded at both ends, slightly or not constricted at the septum; wall uniformly medium thick, 2.5–3 μ, noticeably and closely tuberculate, chocolate-brown; pedicel short, colorless, incompletely deciduous.

On *Heracleum lanatum* Michx., Pillar Point, San Mateo County, California, October 1, 1902, *C. F. Baker, no. 1735.*

Puccinia Diplachnis sp. nov.

II. Uredospores in the teleutosori broadly ellipsoid or nearly globose, 19–21 by 24–26 μ; wall colorless, thick, 3 μ, closely and finely verrucose, pores apparently 4, equatorial.

III. Teleutosori chiefly hypophyllous, oblong or linear, soon naked, pulvinate, prominent, compact, blackish-brown; teleutospores ellipsoid, 20–24 by 32–39 μ, slightly or not contracted at the septum, rounded or obtuse at both ends; wall smooth, medium thick, 1.5–2.5 μ, thicker at the apex, 3–7 μ, chestnut-brown; pedicel tinted next the spore, one to two and a half times length of the spore.

On *Diplachne dubia* Benth., Big Springs, Texas, October 13, 1902, *S. M. Tracy, no. 8270.* The description of the uredo stage is incomplete, as no separate sori were seen. It is probable that the rust on *Diplachne serotina* of Germany is the same species, judging from Sydow, *Uredineen, no. 414*, although both the uredo and teleutospores are a little larger than in the American specimen. The species differs materially from *Puccinia australis* Körn. on *Molinia*, which has its aecidum on *Sedum.* In *P. australis* the teleutosori and spores are lighter colored, and the uredospores have thicker, deep golden yellow walls, with coarser sculpturing.

Puccinia Helianthellae sp. nov.

II. Uredosori amphigenous, scattered, round, soon naked, pulverulent, chestnut-brown; uredospores globose, large, 25–32 μ in diameter; wall chestnut-brown, thick, 3 μ, finely and sparingly echinulate with blunt points, pores 2, equatorial and opposite.

III. Teleutosori amphigenous, scattered, round, soon naked, pulverulent, chestnut-brown; teleutospores ellipsoid, or obovate-oblong, 20–26 by 30–40 μ, rounded or obtuse at both ends, slightly or not constricted at the septum; wall smooth, chestnut-brown, medium thick, 2–2.5 μ, sometimes slightly thicker at apex, 2.5–4 μ; pedicel colorless, delicate, often as long as the spore, imperfectly fugacious.

On *Helianthella Nevadensis* Greene, Nevada County, California, July 31, 1903, *A. A. Heller, no. 7072.* An easily recognizable species on account of its large, thick-walled uredospores, which are of the same shade of brown as the teleutospores. It is probable that *Aecidium Helianthellae* Arth. (Bull. N. Y. Bot. Gard. 2: 348), found in Wyoming, is an early stage of this species, but no direct proof is at hand.

Ravenelia Caesalpiniae sp. nov.

O. Spermogonia chiefly epiphyllous, arising beneath the cuticle, crowded in small groups, depressed, 15–18 μ high by 60–100 μ broad, golden yellow, becoming brownish.

II. Uredosori chiefly hypophyllous, arising beneath the cuticle, at first in small groups circinating about the spermogonia, finally irregularly scattered, roundish or oblong, at first yellowish, afterward ochraceous, ruptured cuticle noticeable; uredospores obovate-cuneate, 16–23 by 28–35 μ; wall thin, 1.5–2 μ, sometimes slightly thicker above, 1.5–3 μ, chestnut-brown, often paler and almost hyaline below, nearly or entirely smooth above, prominently and evenly echinulate below, pores 4, a little above the middle; paraphyses of the periphery clavate, nearly colorless, wall uniformly thin, 1–1.5 μ, paraphyses intermixed with the spores numerous, capitate, slightly tinted above, head globose with very thick wall, pedicel solid.

III. Teleutospores unknown.

On *Caesalpinia* sp., near Bayamon, Porto Rico, June 14–July 22, 1901, *L. M. Underwood* and *R. F. Griggs, no. 879.*

Ravenelia Portoricensis sp. nov.

II. Uredosori amphigenous, in circinating groups about 3 mm. across, subepidermal, soon naked, pulverulent, fulvous, encircling epidermis noticeable; uredospores elliptical, 16–18 by 24–29 μ; wall medium thick, 2.5 μ, golden yellow, thickly echinulate, pores 8, scattered; paraphyses none.

III. Teleutospores unknown.

On *Cassia emarginata* L., Ponce, Porto Rico, December 3, 1902, *A. A. Heller, no. 6193.*

Uredo superior sp. nov.

II. Uredosori amphigenous, elongated, tectate, spores escaping through slits in the epidermis; uredospores globoid, 28–34 by 32–34 μ; wall thick, 3–4 μ, light chestnut-brown, thickly echinulate, pores 2, in upper hemisphere.

On *Fimbristylis spadicea* Vahl, borders of low swampy ground along the coast eight miles west of Ponce, Porto Rico, December, 1902, *A. A. Heller, no. 6279*. The spores are very much larger and coarser than those of the *Puccinia* occurring on *Fimbristylis* in Mexico. No teleutospores were found.

Aecidium Onosmodii sp. nov.

O. Spermogonia amphigenous, in very small circular groups, inconspicuous, punctiform, honey-yellow, entirely immersed, subepidermal, seen in vertical section globose, 90–120 μ in diameter; ostiolar filaments 60–80 μ long.

I. Aecidia hypophyllous, is small circular groups, or solitary, small, pustular; peridia delicate, erect or somewhat recurved, margin coarsely lacerate, peridial cells much thicker on outer than on inner side; aecidiospores globoid, 19–23 by 20–29 μ; wall colorless, medium thick, 2–2.5 μ, closely and finely verrucose.

On *Onosmodium molle* Michx. Type collection from Callaway, Nebraska, May 25, 1902, *J. M. Bates*. It has also been reported from Kansas (Bartholomew, Kans. Ured. 180) and North Dakota (Bolley, Agric. Sci. 5: 263), both on *O. Carolinianum* DC.

Aecidium Mertensiae sp. nov.

O. Spermogonia epiphyllous, in small circular groups, crowded, punctiform, wholly immersed, subepidermal, seen in vertical section, globose, 65–120 μ in diameter; ostiolar filaments 60–90 μ long.

I. Aecidia hypophyllous, in circular groups, crowded, broad and low; peridia spreading, recurved, coarsely lacerate; aecidiospores globoid, 19–26 by 22–28 μ; wall colorless, very thin, 1–2 μ, minutely and closely verrucose, appearing smooth; contents deep orange-yellow.

On *Mertensia paniculata* (Ait.) Don, near Lolo Creek, in the Bitter Root Mountains, Idaho, August 10, 1902, *C. V. Piper*. On *M. Sibirica* (L.) Don, Jefferson Lake, Marion County, Oregon, August, 1892, *Moses Craig*. The former to be taken as the type.

Aecidium malvicola sp. nov.

O. Spermogonia epiphyllous, in groups, punctiform, honey-yellow, immersed, subepidermal, in vertical section globose, 100–125 μ in diameter; ostiolar filaments very numerous, 35–80 μ long.

I. Aecidia hypophyllous, in diffuse circular groups often 10 mm. in diameter; peridia short, cylindrical, margin erect or somewhat revolute, erose; aecidiospores globoid, 14–22 by 16–24 μ; wall colorless, thin, 1.5 μ, minutely and evenly verrucose.

On *Althaea rosea* L. (type), Callaway, Nebraska, July 1, 1902, *J. M. Bates.* On *Malvastrum coccineum* (Pursh) Gray, Wakeeney, Kansas, June 15, 1903, and *Callirrhoe involucrata* (Nutt.) Gray, Rooks County, Kansas, May 31, 1902, *E. Bartholomew.* There are three species of *Aecidium* occurring upon various malvaceous hosts found on the western plains. It is not difficult to distinguish them. *Aecidium tuberculatum* E. & K. has very large aecidial cups of a bright orange color when fresh, *Ae. malvicola* Arth. has average-sized aecidial cups also orange-colored when fresh, and *Ae. Napaeae* A. & H. (of which *Ae. Callirrhoes* E. & K. is a synonym) has slightly smaller aecidial cups which are nearly or quite colorless even when fresh. Beside these, *Ae. roestelioides* E. & E. of Texas has orange-red aecidial cups, the margins of which are slit into long spreading filaments that appear yellow.

Aecidium occidentale sp. nov.

O. Spermogonia amphigenous, in small groups, crowded, rather prominent, honey-yellow, punctiform, wholly immersed, subepidermal, in vertical section globose or somewhat depressed, 110–150 μ in diameter; ostiolar filaments free or somewhat agglutinate, 30–75 μ long.

I. Aecidia hypophyllous, in circular or sometimes elongated groups, rather crowded, broad and low; peridia pale, margin erect, erose; aecidiospores globoid, 18–24 by 23–29 μ; wall medium thick, 2.5–3 μ, colorless, closely and finely verrucose.

On *Clematis Douglasii* Hook., Pullman, Washington, June 2, 1894, *no. 499* (type), and June, 1893, *no. 132, C. V. Piper;* Pullman, Washington, June, 1892, *N. R. Hull;* Moscow, Idaho, May 30, 1897, *L. F. Henderson, no. 4326;* Helena, Montana, June 5, 1889, *F. D. Kelsey.* This species is distinguished from *Ae. Clematidis* DC., which occurs in the same region, by its somewhat smaller and more delicate aecidial cups and spores. The aecidia are also more diffusely grouped, and the spermogonia more prominent. The fungus does not appear to thicken the leaf materially, or produce distortions.

Aecidium recedens sp. nov.

O. Spermogonia amphigenous, few, in small circular groups, punctiform, honey-yellow, wholly immersed, subepidermal, in vertical section globose, 90–110 μ in diameter; ostiolar filaments 45 μ long.

I. Aecidia amphigenous, in restricted circular groups, pustular, constricted by the tissues of the substratum; peridia delicate, evanescent; aecidiospores globoid, 16–23 by 22–29 μ; wall thick, 3 μ, golden-yellow, closely and finely verrucose.

On *Solidago mollis* Bartl., Callaway, Nebraska, June 7, 1902 (type), *J. M. Bates;* Cypress Hills, Assiniboia, *J. Macoun.* The second collection is in the Ellis Herbarium at the New York Botanical Garden, and is erroneously labeled "Aecidium of *Puccinia Columbiensis* E. & E. on *Oenothera biennis.*" It is referred to by Mr. Holway in Jour. Myc. 8: 171, December, 1902. A part of the same collection is in the National Herbarium at Washington. The species is readily told from the common *Aecidium* on *Solidago* by the evanescent peridium, and by the larger spores, having thick, golden-yellow walls.

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